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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/016,562	12/12/2001	Chang-Lin Hsieh	004544 ALRT/ETCH/DICP	6380

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APPLIED MATERIALS, INC.  
2881 SCOTT BLVD. M/S 2061  
SANTA CLARA, CA 95050

EXAMINER

DEO, DUY VU NGUYEN

ART UNIT	PAPER NUMBER
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1765

DATE MAILED: 06/30/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No.	Applicant(s)	
	10/016,562	HSIEH ET AL.	
	Examiner	Art Unit	
	DuyVu n Deo	1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 04 June 2004.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-23 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

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### **DETAILED ACTION**

1. Applicant's arguments, filed 6/4/04, with respect to the rejection(s) of claim(s) 1-23 under Maex et al. (US 2002/0076935) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Li et al. (US 6,168,726), Jiang et al. (US 6,455,411), Chen et al. (US 6,573,187), Tao et al. (US 6,194,128).

### ***Claim Rejections - 35 USC § 102***

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

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3. Claims 1, 2, 4-7, 9, 10 are rejected under 35 U.S.C. 102(e) as being anticipated by Li et al. (US 6,168,726).

Li describes a method for etching a dielectric layer comprising: providing a structure comprising a dielectric layer of TEOS oxide (claimed undoped silicon oxide) and layer of oxidized organo-silane (claimed C,H-doped silicon oxide) (col. 3, line 46-53; col. 6, line 34-42; col. 7, line 46-col. 8, line 30); etching the oxidized organo-silane with a plasma comprising nitrogen and fluorine atoms (col. 12, line 66-col. 13, line 13).

Referring to claims 2, 4-6, the gases comprise N<sub>2</sub> and CF<sub>4</sub> (col. 12, line 66; col. 13, line 10-12). Since the etching gas is the same as that of the claimed invention, it would provide the same etching selectivity between the oxidized organo-silane and the dielectric layer as that of the claims 1, 9, and 10.

4. Claims 1-7, 9, 10 are rejected under 35 U.S.C. 102(e) as being anticipated by Jiang et al. (US 6,455,411).

Jiang describes a method for etching a dielectric layer comprising: providing a structure comprises a TEOS oxide layer (claimed undoped silicon oxide) and a layer of organo-silicate glass (OSG) (claimed C,H-doped silicon oxide) (col. 2, line 1-5, line 65-67; col. 3, line 10-13); etching the OSG layer using a plasma comprises C<sub>5</sub>F<sub>8</sub>/N<sub>2</sub>/CO, N<sub>2</sub>/CF<sub>4</sub> or NF<sub>3</sub> (col. 3, line 24, line 46-50). Since the etching gas is the same as that of the claimed invention, it would provide the same etching selectivity between the oxidized organo-silane and the dielectric layer as that of the claims 1, 9, and 10.

***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 7, 12-20, 22, 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Li or Jiang as applied to claim 1 above, and further in view of Chen et al. (US 6,573,187).

Referring to claim 12, both Li (col. 2, line 52-54) and Jiang (col. 7, line 59) show an underlying layer. Unlike claimed invention, Li and Jiang do not describe a via dielectric layer of undoped or F-doped silicon oxide over an underlying layer and under the trench dielectric C,H doped silicon oxide. Chen describes a method for forming a dual damascene structure having a via dielectric layer of undoped or F-doped silicon oxide 30 over an underlying layer and under the trench dielectric C,H doped silicon oxide 32 such as Black Diamond (col. 2, line 55-65; col. 4, line 50-36). It would have been obvious for one skill in the art to form a dielectric structure in light of Chen because both Li and Jiang describes the dielectric C,H doped silicon oxide is part of a damascene dielectric stack (paragraph [0084]) and Chen teaches various equivalent dielectric stacks in order to form a dual damascene structure with a reasonable expectation of success. Figures 6 and 7 in Chen show the trench is etched through aperture in a patterned masking layer until a portion of upper surface of the via dielectric 30 is exposed for a dual damascene structure.

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Referring to claim 13, all of the references show extended via hole through all the dielectric layers including the trench and via dielectric layer in order to form dual damascene. Jiang (figs 1A, 2A), Li (fig. 2); Chen (fig. 6).

Referring to claims 22, and 23, Li shows that the C,H-doped is deposited by plasma using CVD process (claimed plasma-assisted CVD).

7. Claims 11 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Li or Jiang as applied to claims 1 and 12 above, and further in view of Tao et al. (US 6,194,128).

Unlike claimed invention, applied prior art is silent about etching the low-k dielectric C,H doped silicon oxide using MERIE system. Tao shows that MERIE is used by one skill in the art for etching the low -k dielectric layer (col. 6, line 18-23). Therefore, It would have been obvious for one skill in the art to etch the low-k dielectric C,H doped silicon oxide in light of Tao's system in order to etch the C,H-doped silicon oxide with a reasonable expectation of success.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to DuyVu n Deo whose telephone number is 571-272-1462. The examiner can normally be reached on 6:00-3:30; with alternate Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571-272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

DVD

6/24/04

A handwritten signature, possibly reading "JD", is written in black ink.